Tide Rising

Winter 2022 Volume III, Issue 2

Publisher & Editor: *San Francisco Bay Wildlife Society (SFBWS).*
SFBWS is a not-for-profit Friends Group for the San Francisco Bay NWR Complex,
working along with many Refuge volunteers to keep our public lands sustainable for you and wildlife.

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San Francisco Bay Wildlife Society

Editors: Ceal Craig, PhD
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SFBWS: Chris Kitting, PhD; Hope Presley, MS
USFWS: Joy Albertson, Rachel Tertes, Winnie Chan
Photographers: Ambarish Goswami, Aric Crabb, Ceal Craig, Chris Kitting, Julie Kitzenberger, Rachel Tertes, Winnie Chan

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Learn about another East Bay shoreline spot!

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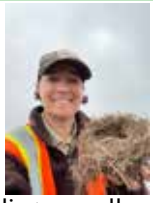
Don Edwards San Francisco Bay National Wildlife Refuge (*Ambarish Goswami*)

Refuge Spotlight

Don Edwards San Francisco Bay NWR (more info)

Formed in 1972, these 30,000 acres are an oasis for millions of migratory birds & endangered species



Holding a small mammal nest found at Pond A19.
(Rachel Tertes)

Adaptive Management in Action at the Island Ponds

by Rachel Tertes, Wildlife Biologist, US Fish & Wildlife Service

Sixteen years ago, Ponds A19, A20, and A21, collectively known as the Island Ponds, were breached as part of the Initial Stewardship Plan of the South Bay Salt Pond Restoration Project (Project). Prior to lowering the man-made levee to reintroduce San Francisco Bay water, the ponds were a barren moonscape covered with grey gypsum (calcium sulfate). With the newly restored tides came sediment and plant material and by 2015, Pond A21 was almost fully vegetated and home to both the endangered salt marsh harvest mouse and California Ridgway's rail. (Read more here).

Western harvest mouse standing on salt rock
(Rachel Tertes)

Landscape view of Pond A19
(Rachel Tertes)

Amphibious excavator dipping its bucket into Pond A19
(©Julie Kitzenberger)

On the eastern end of the Island Ponds, Pond A19, and A20 to a lesser degree, were developing more slowly and lacked vegetation and channelization. Therefore, the Project decided to include Island Pond enhancements to the Phase 2 Restoration Project.

Fast forward through the Phase 2 plan development, design, and permitting processes, and in October 2021 we started construction. The plan was to lower and remove long segments of levees around Ponds A19 and A20 and add two breaches to the north side of Pond A19 along Mud Slough. Upon preparing the site, what we found made us stop and change our plans.

Vegetation had increased within Pond A20 and A19 during the 5 years of design and planning, much more so than in the first 10 years post breach. In addition, as the construction manager, Ducks Unlimited and biological monitors, started to clear vegetation along the levees to prepare for the earth work, nests were found. What kind of nests? A few bird nests, of course, but mostly small mammal nests. While the vast majority were empty, a few were occupied by mice. Small mammals of all sorts have been found, including salt marsh harvest mice, western harvest mice, California voles and even a shrew. The abundance and variety of nests was unexpected, especially since the remnant levees, covered mostly by non-native vegetation and salt rocks, are not the standard for nesting mouse habitat.

Instead of putting on blinders and forging ahead with our plans, we got our boots on the ground (and stuck in the mud) to determine locations where we could scale back or relocate activities to achieve the greatest habitat and ecological improvements with the least negative impact from construction. We worked hard to balance short term impacts and long term goals. In short, we successfully applied adaptive management that not only limits the short term impacts to existing mice and other small mammals, but also allows for the restoration and development of an additional 330 acres of tidal marsh habitat at Ponds A19 and A20. Construction is wrapping up now and will be complete by publication of this issue.

Antioch Dunes NWR (more info)

Established in 1980 to protect three endangered species: the Lange's metalmark butterfly (Apodemia mormo langei), the Contra Costa wallflower (Erysimum capitatum angustatum), and the Antioch Dunes evening primrose (Oneothera deltoides howellii). It's the only National Wildlife Refuge (NWR) in the country established to protect endangered plants and insects. Due to the sensitivity of the habitats and these endangered species, the Refuge is not open to unsupervised use by the public

2021 Contra Costa Wallflower seeding experiment at Sardis Unit

By Joy Albertson, Supervisory Wildlife Biologist, and Winnie Chan, Refuge Planner-San Francisco Bay NWR Complex

Blooming Contra Costa wallflowers with a river view at Antioch Dunes NWR *(Aric Crabb)*

NOTE: Special permits were obtained for any movement of endangered species described herein

The Contra Costa wallflower (*Erysimum capitatum*) is a federally listed species endemic to the remnant riverine dune habitat found at Antioch Dunes National Wildlife Refuge. The wallflower has been actively managed on the Refuge through invasive vegetation control, surveys, propagation, planting, and seeding to address threats to the wallflower as well as directly augment the population. The recent spring 2021 wallflower count identified only 975 individuals found on the entire Refuge, compared to over 4,000 in 2017. As wallflower persistence from seeding efforts was not always adequately evaluated and in response to this year's decline, refuge staff decided to actively increase wallflower populations through a seeding experiment in the short-term, which would also help inform our efforts on a long-term plan for maintaining higher wallflower populations. In November 2021, refuge biologists initiated a wallflower seeding experiment to investigate the best method of conducting seeding operations, comparing effectiveness of three different ground disturbance techniques.

For the experiment, we wanted to know the most efficient (time and resources) method of ground treatment for seeding wallflowers that results in large self-sustaining populations over the long term. We also wanted to understand appropriate seeding rate (amount of seed needed per square meter of land) in order to inform seed collection and cleaning effort, which is a time-consuming task. The ground treatment methods we selected were: 1) control (no ground disturbance), 2) raking (removal of thatch), and 3) McLeod (clearing off the vegetation with a bladed hand tool called a McLeod). For each of these three ground treatments, we decided to also compare seeding versus no seeding, as there is likely existing wallflower seed in the soil in some locations. Our assumption was that if enough natural seed already exists, perhaps we wouldn't need to even seed in certain areas! A total of six combinations of ground disturbance/seeding were selected in this experiment.

Biologists first identified appropriate locations for the wallflower seeding, based on locations where large numbers of wallflower occur or occurred in recent years. For these reasons, the PG&E East Management Area of the Sardis Unit (*shaded purple in Figure to the right*) and the adjacent north-facing slope were selected.

The wallflower is a short-lived perennial, germinating into an immature seedling the first year and developing into a mature, flowering plant the spring of the second year. Flowering plants produce seeds, senesce, then die. The wallflower thrives on wind-blown open sand and is often found on north-facing slopes, or in partially shaded locations under taller vegetation such as shrubs or trees. For effective management, it is important for us to understand the life cycle of the species being managed and to identify current threats to the species.

Map of Sardis Unit Management Areas, showing PG&E East in purple *(Winnie Chan)*

Antioch Dunes NWR *(continued...)*

2021 Contra Costa Wallflower seeding experiment at Sardis Unit

(continued from prior page)

With support from our botanist for the Refuge Complex, Aidona Kakouros, we determined size and location of our Experimental Blocks (or "Blocks") and the seeding rate for wallflower (per square meter). The design for this experiment is a split-plot in Randomized Complete Block Design. Each Block is one replicate and includes a plot of each of the three ground treatments, with each ground treatment plot further divided into "split-plots" for the seeding or no seeding treatments (*see figure to right*). Six Experimental Blocks are in the flat area of PG&E East, and four are on the adjacent north facing slope.

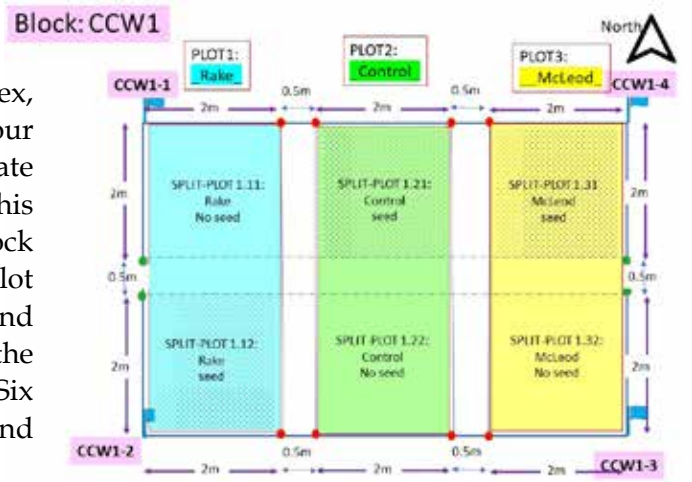


Diagram of a wallflower Experimental Block, with split-plots (*Aidona Kakouros*)

Next, we established the Blocks, including flagging, mapping locations using a Global Positioning System device. Wallflower seed collected in 2020 was measured out for each split-plot to be seeded (for all Blocks) and placed in envelopes labeled with the split-plot number prior to the field day. In early December 2021, several refuge staff conducted the experiment using rakes, McLeods, and lots of muscle to do ground treatments in the plots (*see image to right*). The amount of treatment time per plot was recorded as a factor in our assessment. On December 15, 2021, we did the official seeding and lightly raked in the seed (*see image in lower right*). As we were leaving the Refuge, a light rain started to fall… a good sign from Mother Nature perhaps?!

Louis Terrazas conducting ground preparation on north river slope with a McLeod (*Winnie Chan*)

Next steps for the experiment include monitoring wallflowers (quantities and lifespan) and invasive vegetation in the Experimental Blocks to inform our questions and ultimately guide future management of wallflowers at the Refuge. We will consider the recovery goals of this species in planning future management of wallflowers, including population goals. As we have had plenty of rain since the field effort, we are anticipating a lot of wallflowers germinating in the Blocks!

Jerrod Sellers seeding wallflowers in a McLeod disturbance plot on PG&E East flats (*Winnie Chan*)

Tides Rose!

San Francisco Bay Wildlife Society

by Christopher L. Kitting, Ph.D., Professor of Biological Sciences at CSU East Bay, and SFBWS President, Board of Directors

Tides are changing, overall. Our old newsletter had been called *Tideline*, but that line is crossed, as overall sea level rise is accelerating, globally and locally, as the planet warms. NASA satellite data recently showed major ice sheets, both in Antarctica and Greenland, melting even faster than expected, as greenhouse gases emitted into our atmosphere continue to rise, despite decades of warnings to curb those emissions. Shorelines will continue to migrate upward, with major shifts in plant and animal distributions, including humans and our wildlife, and most cities of the world. Consistent with others, the California non-partisan Legislative Analyst's Office recently concluded that (compared with standard sea levels from 1990s): "Scientific estimates suggest the magnitude of sea level rise (SLR) in California could be at least half of one foot in 2030 and as much as seven feet by 2100." Are you one of the many people who live near sea level, or rely on our present shorelines staying put? Practically all of us rely on stable shorelines, and a more stable, historic climate.

Maybe you too witnessed recent, annual king tides, unusually high tides, predicted (based on sun and moon positions) for around January 2 each year. These brief high tides offer us a glimpse of future, rising average sea levels, arriving more often and sooner than previously forecast (over a meter vertically, within decades). Our low-lying, marshy shorelines appear to be a first line of natural defense, if and when rapid growth and sediment accumulation among marsh plants can keep up with sea level rise, as a sustainable, living levee. Higher seawalls merely would sink into marshes, faster. Marsh plants have additional benefits of sustainable water filtration, CO2 removal from the atmosphere, erosion prevention, and diverse wildlife habitats for diverse species.

January 1, 2022 king high tide just north of Refuge offices in Newark, CA
(©2022 by C. Kitting)

Consider the impact of the January 1, 2022 king tide on the marsh near the San Francisco Bay National Wildlife Refuge Complex main offices (near Fremont). Around that date, Earth's annual orbit is closest to the sun (by ~1.6% of Earth's average distance), and the sun's (and moon's) gravity combine to literally pull ocean water levels, tides, higher (and lower, ~6 hours after high tide) than usual. A second image from 2014 shows an average sea level here, ~4 feet (~1.2 m) lower, vertically. A lowest tide would be another ~4 feet (~1.2 m) lower, vertically, leaving deep, open mudflats here.

Average tide at that same area, October 28, 2014
(©2022 by C. Kitting)

by Christopher L. Kitting, Ph.D., Professor of Biological Sciences at CSU East Bay, and SFBWS President, Board of Directors

Although low-lying areas still flooded during these king tides, a different factor saved us locally from worse flooding this year on those dates, as these recent king tides turned out to be high, but not extraordinarily so. Recent, local work showed that typical day-to-day changes in **atmospheric pressure** modify tidal levels temporarily, by a foot (0.3 m) vertically. On such a sunny day as our January 1, 2022, with high atmospheric pressure, tides were ~1 foot lower than forecast. Yet high shore species, such as *Distichlis spicata* salt grass, became submerged at this very high tide, along with *Sarcocornia pacifica* pickleweed (see photos below), where endangered salt marsh harvest mice live. A cloudy day (with low atmospheric pressure) would have tides about a foot higher, with even more flooding of shorelines. US Fish and Wildlife Service reports that such wetland flooding is catastrophic for salt marsh harvest mouse populations, an already endangered species.

Close view of marsh vegetation awash during king high tide, via ultrawide "Camera on a Stick": 5 cm =2 " across *(©2022 by C. Kitting)*

"Hold your breath." Inundated high marsh vegetation 20 cm =8" across, during king high tide, via Kitting's ultrawide "Camera on a Stick." *(©2022 by C. Kitting)*

What can you do to combat effects of sea level rise? Our atmosphere, life, and shorelines could be saved (or not) **one step at a time**, at least buying us time to delay catastrophes, and allow time for future improvements. For now, we are trying to conserve and restore these living levees fast enough, via shoreline protection and marsh restoration. Simultaneously, vigorously attacking this root cause of sea level rise is critical to avoid climate disruption from greenhouse gas emissions, largely CO2, and methane.

The United States could even **reverse** otherwise increasing CO2 if we restored and maintained about 10 times our present area of durable plant life (which uses sunlight to convert CO2 into plant matter and oxygen). That happens to be the historic, sustainable condition too, maintained by many aboriginal cultures, long before other humans became the most abundant large animal species on Earth, with the next most abundant being cattle and sheep. Each step can help (or harm, if it is a step in the wrong direction).

Thanks for joining us in doing more **of our part,** and that part that procrastinators and deniers have avoided doing. Increased burning of fossil fuels, with increasing numbers of consumers, has led to this period in Earth's geologic history known as the "Anthropocene" (age of human influence) or "Pyrocene" (age of burning). Instead, let's turn things around, and make this a **good** period of Earth's history, as **recovery**. This pandemic is offering us analogous lessons about harm and recovery. I am particularly grateful to Shoko Furuya and Ceal Craig, SFBWS members who help make this work and *Tide Rising* articles possible.

Chris

San Francisco Bay Wildlife Society NEWS

Where Sunnyvale Meets the Bay: Environmental Education & Interpretation Activities:

by Hope Presley, MS, SFBWS Watershed Watchers Coordinator

On October 21, 2021, Watershed Watchers hosted a program in partnership with the Sunnyvale Library titled *Where Sunnyvale Meets the Bay*. This program was geared towards families and English as a second language learners (ESL).

The weekend before the program, Olivia Poulos, WW Interpretive Associate, hosted a table outside the Library to engage patrons and advertise the program. As a result, we had a large number of participants who learned about how their community is connected to the Bay and Refuge by their local watershed. This partnership continues into 2022 as we plan to host another program in partnership with the Sunnyvale Library in March 2022.

If you are a resident of Sunnyvale and a patron of the public library, be on the lookout in the coming weeks for the advertisement! The program is titled, *Nature's Resilience and Spring Wildlife at Don Edwards National Wildlife Refuge*.

LEARNING ACTIVITIES & LINKS

Videos & At-home Activities from 2021

Hour-long Programs:

- Virtual Hike for California Biodiversity Week
- Secret World of Vernal Pools
- Wetland Restoration in the South Bay

Short Videos:

- Wetland Biodiversity video
- Preventing Pollution video
- Pollinator Week video
- Celebrating Rachel Carson video

At-home Activities:

- Be A Scientist activity book
- Earth Day
- DIY Bird Feeder

SFBWS Staff Changes

Leaving: Hope Presley, who recently earned an MS in Resilient and Sustainable Communities,Watershed Watchers Specialist, is leaving the Society to work for USFWS in Washington state. We wish her well in her move to Visitor Services in the Northwest and express our appreciation for her work these past several years as an active staff member and evangelist for Watershed Watchers programs.

Changing Position: Olivia Poulos will be replacing Hope in the Watershed Watchers role. She is a graduate of the University of Oregon with a Bachelor's degree in Sociology, and two minors in Environmental Studies and City Planning, Public Policy, & Nonprofit Management. She was born and raised in the South Bay and has been with the Refuge since early 2020. In the last year as the Watersheds Watchers Associate, she has enjoyed creating outreach and education programs to engage with our local communities.

Olivia Poulos
(*self*)

Nature Store Books & Membership Gifts

Though our Nature Stores at the Environmental Education Center in Alviso and Visitors Center in Fremont remain closed, we are processing orders for three books, available at our website. You can buy books online here using your credit card. See a list of books on the next page!

We are offering a free one-year membership to SFBWS to anyone who orders a book. Please use this gift order form. Obtain your free membership by emailing Mary with the content on the form. You will need to provide your name, mailing address, email address for our quarterly newsletter and phone number (optional).

You can start your membership with a donation. Each year we will send you a letter with a progress update and ask if you would like to continue your membership. Members are entitled to a 15% discount at our Nature Stores, are invited to attend special events, and provide input and feedback for our not-for-profit Friends Group supporting the San Francisco Bay National Wildlife Refuge Complex. And, you can also volunteer!

Nature Themed Gifts

Place orders: *https://sfbayws.org/nature-gifts-order-form*

Share your love of Nature and the Refuges

Sinking Underwater

Members: $16.38 including tax
Non-members: $19.66 including tax plus shipping (see order form)

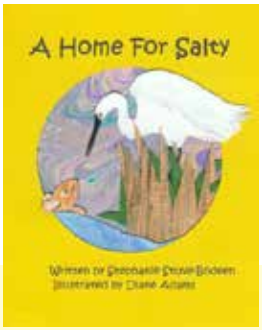
Drawbridge has a certain mystique, even though it "died" over 35 years ago. Because of its isolation on a marshy island, it remains unknown - even to people who live a few miles away.

This unusual community lacked streets, schools or stores and its buildings were constantly sank into swampy water. Residents had to walk three miles on railroad tracks to the nearest grocery. Their kids trudged to school on those same busy tracks. Still, residents loved its lifestyle.

Why were they forced to leave?
Why is the island off limits today?
The town remains alive in an unusual manner.

You will meet the hardy folks who lived there and learn their stories firsthand, thanks to unexpected events that took place after it became a ghost town. Photos and rare interviews with former inhabitants bring Drawbridge to life again, allowing readers to experience the town without slogging through its mud.

113 pages



A Home for Salty

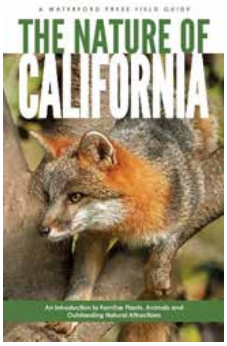
Members: $6.50 including tax
Non-members: $7.64 including tax
plus shipping (see order form)

Read about the adventures of a salt marsh harvest mouse, an endangered species that lives on the San Francisco Bay National Wildlife Refuge. 32 pages.

The Salt Marsh Harvest Mouse, also known as Salty, is found along the edges of San Francisco, San Pablo, and Suisan Bays and no where else in the world.

Salty is an endangered species, meaning that there aren't many Saltys around. Why is Salty endangered? Salty only lives in the Salt Marsh habitat. The marsh habitat has decreased over 80% within the past 100 years. With less space, it is difficult for Salty to find food, water, and shelter. Salty only lives for 9 months, which makes it more difficult to find a partner and make a family.

Due to living in a salty environment, Salty can swim and drink salt water. Salty is the only mouse species that can survive in salt water. Salty has a special salt gland that allows it to drink salt water. Salty is nocturnal which means that it is only awake at night. Salty is only about the size of your thumb, with a tail. Salty's main diet is pickleweed; it also makes its home out of pickleweed and uses pickleweed to hide from predators. Salty is a unique mammal that we can protect by keeping our marshes and watersheds free from pollution.



The Nature of California

Members: $15.73 including tax
Non-members: $18.51 including tax
plus shipping (see order form)

"This beautifully illustrated field guide highlights over 370 common and unique plants and animals and 85 of the state's outstanding natural attractions. It is an indispensable single reference for amateur naturalists, students and tourists alike." 176 pages.

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Photography Corner

Don Edwards SFB NWR in Winter
(*Ambarish Goswami*)

Sandpipers in foam
(*Rachel Tertes)*

Pickleweed in LaRiviere Marsh, Fremont
(*Rachel Tertes)*

Grey Fox, San Luis NWR
(*Tim Craig*)

Please share your photos of our Refuges and other Refuges you visit!

White-crowned sparrow
(*Rachel Tertes)*

Sandhill crane at San Luis NWR
(*Ceal Craig*)

USFWS Staff Changes

Melisa Amato was hired as the Wildlife Refuge Manager for the San Pablo Bay, Marin Islands, and Antioch Dunes NWRs. She started in her new role late September.

Melisa Amato, Wildlife Refuge Manager

We said goodby in late October to **Lydia Woltjer**, maintenance worker and wished her well in her new position at UC Berkely as their Landscape Supervisor.

Congratulations to **Jim Griffin**, Maintenance Worker for San Pablo Bay, Marin, and Antioch Dunes NWR's for his 40 years of Federal Service!

Gissell Aguilar, Refuge Ranger

Joining USFWS, **Giessell Aguilar** will begin as Refuge Ranger at the EEC in early 2022. She was born and raised in South Lake Tahoe, California. She attended the University of New Orleans (UNO) studying biology while also assisting in research on sandhill cranes. Giessell received her Bachelor of Science in Biology from UNO in 2013 and after graduation was selected to participate in the Mosaics in Science internship program with the National Park Service. Previously, she worked as the Lead Park Ranger (interpretation) at Muir Woods National Monument focusing on untold stories, fire ecology and Indigenous ecological knowledge. Before that, Giessell work as a Biologist at Manassas National Battlefield Park in Virginia. In her free time, Giessell explores California's Pacific Coast. On weekends, she drives either north or south, picks a route from the many miles of hiking trails, and explores and learns more about the flora and fauna found on the trails

Aidona Kakouros has been hired as the San Francisco Bay NWR Complex botanist. Her primary duties will be conducting the biological monitoring program at the Warm Springs Unit of Don Edwards San Francisco Bay NWR, including aquatic vernal pool surveys, vegetation surveys, grazing assessments, and invasive plant programs. She will also serve as the Complex Botanist, assisting other biologists with plant monitoring protocols, site specific restoration plans, and technical expertise on plants and habitat related objectives. Aidona also enjoys outreach and interpretation and will continue to lead public vernal pool tours, work with school groups, lead volunteer events, and share her love of Warm Springs, plants and habitats through various opportunities.

Aidona Kakouros, Botanist

Aidona grew up in Greece where she discovered her love of plants, nature, and environmental education, earning a Bachelor's in Forestry and Natural Environment Studies at Aristotle University. She then moved to the U.S. and received her Master's in Environmental Studies at San Jose State. She has held positions with the City of Mountain View, San Francisco Bay Bird Observatory, and San Francisco Bay Wildlife Society. It was while she was at SFBBO that she first began to work at the Warm Springs Unit and has since developed a deep connection to this site. She began her USFWS career in 2016 with a four-year term position as the Complex botanist/ecologist and lead Warm Springs biologist. Her new position offers her the opportunity to combine her love for nature, science, and building partnerships to find creative solutions in conservation. She considers the San Francisco Bay NWR Complex refuges as special places where we can learn about nature's way to sustain intricate life webs and as gateways for the amazing diverse Bay Area communities to experience and connect with nature. Aidona yearns for promoting sustainability, diversity, and environmental stewardship through her work.

Aidona enjoys cooking, gardening, STEAM education, painting, upcycling, camping, and hiking. She lives in San Jose with her husband, two boys, and dozens of fish.

SAN FRANCISCO BAY WILDLIFE SOCIETY: DONOR RECOGNITION

We gratefully acknowledge the following donors who have made gifts to the San Francisco Bay Wildlife Society from October 1 through December 31, 2021.

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Ibrahim Khatri
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David Stronck

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LINK here

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My membership will help the S*an Francisco Bay National Wildlife Refuge Complex* and its south Bay and Outer Bay Refuges
(Don Edwards, Salinas River, Ellicott Slough, and the Farallon Islands)

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Thank you for your support!

For more than 30 years, the San Francisco Bay Wildlife Society has:

- Introduced the refuge to tens of thousands of students of all ages
- Helped fund the Bair Island restoration and Management Plan, restoration work at Antioch Dunes NWR, and uplands restoration at the Environmental Education Center (EEC)
- Provided Saturday staff in EEC through long-term partnership with the Santa Clara Valley Urban Runoff Pollution Prevention Program
- Provided funding for a new boardwalk at the New Chicago Marsh Trail at the EEC.
- Funded a new greenhouse
- Provided funds for a native plant nursery
- And much more….

Help continue this tradition by becoming a Supporting Member of the Society.

Benefits include:

- Tax deduction to the extent permitted by law
- Free book – Exploring Our Baylands
- 15% discount at SFBWS Nature Stores
- The joy of helping protect this important environment
- Free subscription to *Tide Rising* newsletter

www.sfbayws.org